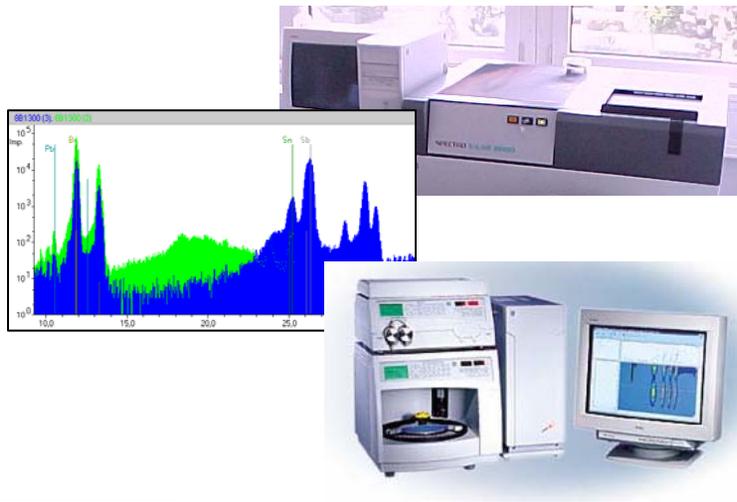


IEC TC 111 Working Group 3

Procedures for the Determination of Six Regulated Substances in Electrotechnical Products



IEC TC 111 WG 3

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NIST Workshop Presentation

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Overview

- **Regulatory Drivers**
- **Role of Testing & Test Standards**
- **Mission, Goal & Scope of IEC TC 111 WG 3**
- **Sample & Testing Procedures**
- **Documents & Timeline**



Introduction

- Legislation targets the use of certain substances in electrotechnical products
 - **Europe: Restriction of Hazardous Substances (RoHS)**
 - **China: Management Methods on the Prevention and Control of Pollution Caused by Electronic information Products (Chinese RoHS)**
 - **US (California): Electronic Waste Recycling Act (S.B. 20), Electronic Waste, Advanced Disposal Fees (S.B. 50)**
 - **Other regional regulations**
- **Pb, Hg, Cd, Cr VI, and two types of brominated flame retardants (PBB, PBDE) are targeted**



Why Testing? And How?

- Testing may be performed for a variety of reasons:
 - **As an alternative to supply chain material declarations**
 - **As a supplement to a material declaration**
 - **As a “spot check” to confirm supplier compliance**
 - **As a basis to assess compliance (enforcement)**
- Certain test methods to determine regulated material content already exist, but:
 - **Most are not appropriate for testing electrotechnical products**
 - **Testing methods differ from each other**
 - **Methods are not internationally recognized**
 - **Not agreed upon by countries regulating substances in EEE**



Importance for Setting Standard Testing Methods

- Compliance checks have to be performed in a consistent and reliable manner
- Need for detailed specifications of standard methods to verify compliance with the regulations
- Standard methods need to be implementable by laboratories all around the world
- International standard methods encourage trade of products by avoiding technical barriers
- Harmonisation of compliance and enforcement methods is essential for a proper functioning of the global market



Mission & Goal IEC TC 111 WG 3

- **Mission:**
 - **Develop a standard that will define test procedures that will allow the electrotechnical industry to determine the concentration of the regulated substances Pb, Hg, Cd, Cr VI, PBB, PBDE (EU RoHS, China, US, Japan, etc.) in electrotechnical products on a consistent global basis**
- **Goal:**
 - **Develop a standard for electrotechnical industry to be used by labs globally for OEMs, suppliers, NGOs, governments, etc.**
 - **The draft standard will be submitted as proposal for an IEC standard**



Scope IEC TC 111 WG 3

- This standard provides test procedures for determining the concentration of Lead (Pb), Mercury (Hg), Cadmium (Cd), hexavalent Chromium (Cr VI), and two types of brominated flame retardants, Polybrominated Biphenyls (PBB) and Polybrominated Diphenyl Ethers (PBDE) contained in electrotechnical products

What is Outside of the Scope?

- The standard will not determine:
 - Definition of a “unit” or “homogenous material” *as the sample*
 - Disassembly procedure to get to a sample
 - Assessment procedures (e.g. is the concentration compliant with the regulation)
- “Practical Guide for Testing Electronic Products” as guidance included (Annex A):
 - Annex to the standard provides practical guidance to disassembly, sample selection and application of the test methods defined in the standard

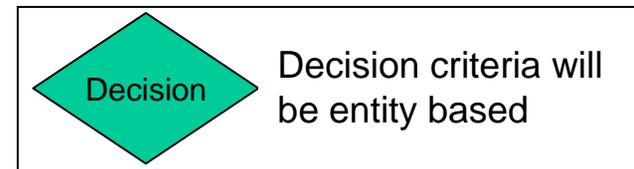
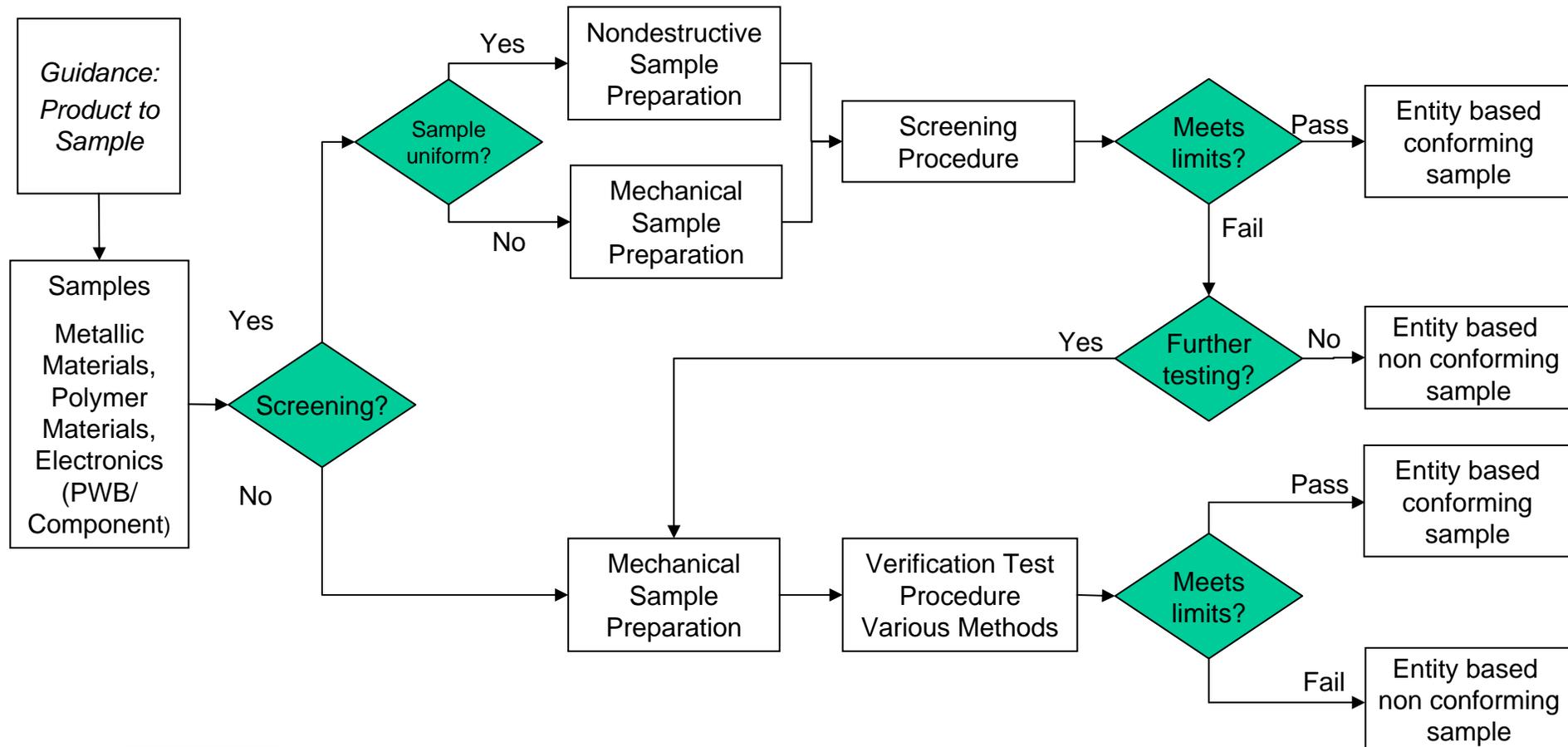


Sample

- Standard refers to the “sample” as the object to be processed and measured
- What a sample is (product, field replacable unit (FRU), component, homogenous material) is decided by the entity
- The entity can decide to prepare a sample which is a “homogenous material” according to the EU definition
 - **For this kind of sample the procedures offered for metallic materials or polymer materials are especially suited**
- The entity can also decide to prepare a sample which is a on the component, FRU or product level
 - **For this kind of sample the procedures offered for electronics are especially suited**



Test Procedure Flow



Screening Test Procedure

- Screening is performed using XRF (EDXRF [Energy Dispersive X-Ray Fluorescence] or WDXRF [Wavelength Dispersive X-Ray Fluorescence])
- Screening test procedure can be carried out by:
 - **Directly measuring the sample (non-destructive sample preparation)**
 - **Destructing the sample to make it uniform (mechanical sample preparation)**
 - **Decision must be made by judging the uniformity of the sample**
 - **Plastics, alloys, glass are usually uniform**
 - **Components, populated PWB need mechanical sample preparation**
- **Pros: Screening is fast and resource efficient**
- **Cons: Screening has limitations to use and applicability of results**
- Screening allows to distinguish between samples in three basic classifications:
 - **Pass (white area): Samples that clearly contain concentrations, which are below the tolerated values**
 - **Fail (black area): Samples that are clearly higher than the tolerated values**
 - **Inconclusive (grey area): Samples that require additional investigation, due to inconclusive analysis results**



Verification Test Procedures

Steps	Substances	Polymer Materials	Metal Materials	Electronics (PWBs/Components)
Mechanical sample preparation (Chapter 5)		Direct measurement Grinding	Direct measurement Grinding	Grinding
Chemical sample preparation		Microwave digestion Acid digestion Dry Ashing Solvent extraction	Acid digestion	Microwave digestion Acid digestion Solvent extraction
Analytical technique definition (incl. typical margins of errors)	PBB/PBDE	GC/MS (Chapter 7) HPLC/UV (Chapter 8)	NA	GC/MS (Chapter 7) HPLC/UV (Chapter 8)
	Cr VI	Alkaline Digestion/ Colorimetric Method (Chapter 10)	Spot-test procedure/ boiling-water-extraction procedure (Chapter 9)	Alkaline Digestion/ Colorimetric Method (Chapter 10)
	Hg	ICP-AES, ICP-MS, CV AAS, AFS (Chapter 11)		
	Pb/Cd	ICP-AES, ICP-MS, AAS (Chapter 12)	ICP-AES, ICP-MS, AAS (Chapter 13)	ICP-AES, ICP-MS, AAS (Chapter 14)

GC/MS: Gas Chromatography / Mass Spectroscopy
HPLC/UV High Performance Liquid Chromatography / Ultra Violet
ICP-AES: Inductively Coupled Plasma - Atomic Emission Spectroscopy
ICP-MS: inductively Coupled Plasma - Mass Spectrometry
CV AAS: Cold Vapor Atomic Absorption Spectrometry
AFS: Atomic Absorption Spectrometry



Outline of the Test Procedures

- Scope, application and summary of method
- References, normative references, reference methods and reference materials
- Terms and definitions
- Apparatus / Equipment and materials
- Reagents
- Sample preparation
- Test procedure, which includes:
 - **Calibration**
 - **Instrument performance**
 - **Sample analysis**
 - **Calculation of analytical results**
 - **Test report**
 - **Quality control**



Outline of the Standard

- FOREWORD
- INTRODUCTION
- 1. Scope
- 2. References
- 3. Definitions
- 4. Test Procedure Overview
- 5. Mechanical Sample Preparation
- 6. Screening by XRF Spectroscopy
- 7. Determination of PBB and PBDE in Polymer Materials by GC/MS
- 8. Determination of PBB and PBDE in Polymer Materials by High Pressure Liquid Chromatography with Ultraviolet Detection (HPLC/UV)
- 9. Test for the Presence of Hexavalent Chromium (Cr VI) in Colorless and Colored Chromate Coating on Metallic Samples
- 10. Determination of Hexavalent Chromium (Cr VI) by Colorimetric Method
- 11. Determination of Mercury in Polymer Materials, Metallic Materials and Electronics by CV-AAS, AFS, and ICP-AES/MS
- 12. Determination of Lead and Cadmium in Polymer Materials by ICP-AES, ICP-MS, and AAS
- 13. Determination of Lead and Cadmium in Metallic Materials by ICP-AES, ICP-MS, and AAS
- 14. Determination of Lead and Cadmium in Electronics by ICP-AES, ICP-MS, and AAS
- 15. Reference Methods and Materials
- Annex A (informative) A Practical Guide for Testing Electronic Products



Documents

- Committee Draft (CD) "Procedures for the Determination of Levels of Regulated Substances in Electrotechnical Products" (IEC Project number: IEC 62321, Ed.1, 111_24e_CD.pdf)
- Comments document (111_25e_INF.pdf) listing all comments received and action taken by WG 3
- Comments on the CD (111_Comment Form 24e CD.doc)
- **Comments were received through National Committees (closed 23 Sept '05)**
- **CD can be commented on at voting, comments will be addressed prior to issuance**



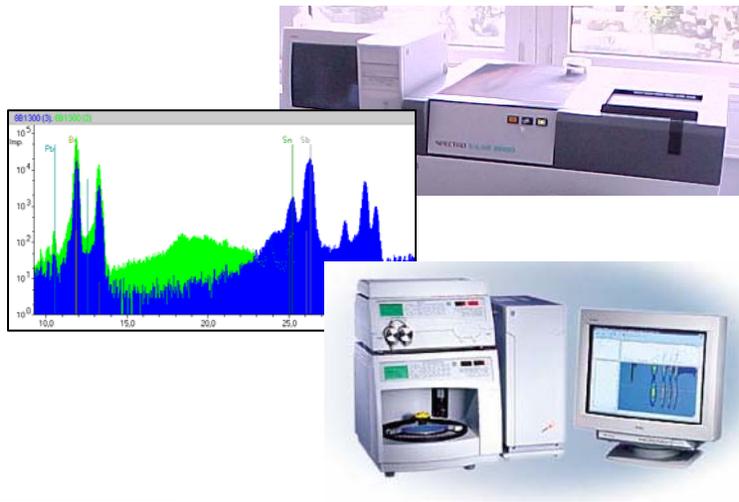
Timeline

- **Committee Draft** 24 June '05
- **End Commenting Period** 23 Sept '05
- **WG 3 Meeting** 19/20 Oct '05
- **Committee Draft for Voting** 15 Dec '05
- **Final Draft International Standard (expected)** July '06
- **Standard (printed, expected)** Oct '06



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**NIST Workshop
6 Oct 2005**

Thank You

